

Instructor:	Prof. Anthony Várilly-Alvarado	Time:	TuTh 9:25-10:40AM
Office:	222 Herman Brown	Classroom:	Herman Brown 453
Email:	varilly@rice.edu	Office Hours:	Tu 11AM-12PM & TBA
Class Webpage:	Look for Math 566 001 Sp14 on Owlspace.		

Pre/Co-requisites: Math 463 or equivalent is required. Math 464 should be taken concurrently (some notions from this class I will take as “black boxes”).

Texts:

J. Neukirch, *Algebraic Number Theory*, Grundlehren der mathematischen Wissenschaften **322**, Springer, Berlin Heidelberg (1999).

J.-P. Serre, *A Course in Arithmetic*, Graduate Texts in Mathematics **7**, Springer, New York (1973).

M. Bhargava, *On the Conway–Schneeberger Fifteen Theorem*, Quadratic forms and their applications (Dublin, 1999). Contemp. Math. **272**. Providence, RI: Amer. Math. Soc., 27–37.

Bhargava’s article is available at: <http://www.fen.bilkent.edu.tr/~franz/mat/15.pdf>

Homework: Due once a week, on **Thursdays**. I will create a growing bank of problems of varying difficulty. Students enrolled in Math 466 should do 2 problems per week and hand them in. Students enrolled in Math 566 should do 3 problems per week and hand them in. Graduate students should enroll in Math 566.

The homework is not pledged and you can collaborate with other students in the class. In fact, you are very much encouraged to do so. However, you are not allowed to look up solutions in any written form; in particular, you are not allowed to look up solutions online. You should write up your solutions individually.

Exams: There will be no exams.

Grades: Homework will count for 100% of your final grade; your lowest two homework scores will be dropped.

Attendance: Attendance is not required. However, you are responsible for all the material and announcements covered in lecture. While Owlspace is a valuable resource, not all announcements will be posted there. Nevertheless, you are responsible for reading any emails I send to the class through Owlspace.

Expectations: In my experience as a student, most people do not follow all the details of a Math lecture in real time. During lecture, you should expect to witness the big picture of what’s going on. You should pay attention to the lecturer’s advice on what is important and what isn’t. A lecturer spends a long time thinking on how to deliver a presentation of an immense amount of material; they do not expect you to follow every step, but they do expect you to go home and fill in the gaps in your understanding. Not attending lecture really hurts your chances at a deep understanding of the material.

Disability Support: Any student with a documented disability seeking academic adjustments or accommodations is requested to speak with me during the first two weeks of class. All such

discussions will remain as confidential as possible. Students with disabilities will need to also contact Disability Support Services in the Allen Center.

Topics to be covered

We will cover Chapters I and II of Neukirch's book, Chapters I-IV of Serre's book, and Bhargava's article.

1. **Number fields:** Definitions, examples. Algebraic integers; Dedekind domains. Lattices and the geometry of numbers. Finiteness of the ideal class group. Dirichlet's Unit Theorem. Ramification theory.
2. **Local Fields:** p -adic numbers. Valuations. Completions. Hensel's Lemma and Henselian Fields. Unramified and tamely ramified extensions. Extending valuations; Galois theory of valuations.
3. **Quadratic forms:** Hilbert symbols. The Hasse-Minkowski Theorem. The Bhargava-Conway-Schneeberger 15-theorem.